was screwed. The wood was tuned by planing it away at the top and bottom, while the air cavity was tuned by enlarging the circular opening in front. In the later researches the box stood on four feet made of india-rubber tubing. The note of the fork so mounted was very strong. At 40 cms. distance it would set the sound-mill in motion.

Dvorák's second apparatus, a "rotating resonator," consists of a short cylindrical box, constructed of stiff glazed paper, having four projections, shown in plan and elevation in Fig. 3, each of which bears at its side a short open tube of paper. It is, in fact, a resonator with four openings, arranged so that it can be hung upon a silk fibre. A fine needle projects also below to steady the

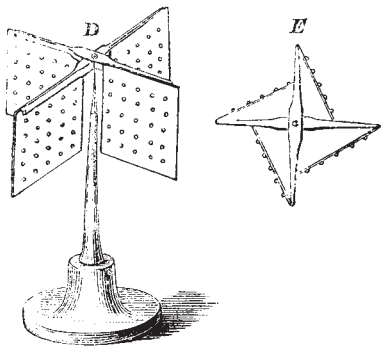

FIG. 4

motion during its rotation, which occurs whenever the apparatus is brought near to the sounding-fork. For the note g' the dimensions were: diameter, 7 cms.; height, 3·6 cms.; diameter of openings, 0·6 cm.

The third apparatus is the "sound-radiometer" described by Dvorák before the Imperial Viennese Academy in 1881. Its cause of action is less readily explained, though its construction is even more simple. Its form is shown in Fig. 4, D; there being, as before, a light cross of wood, pivoted by a glass cap upon a vertical needle. To the four arms of the cross are cemented four pieces of fine white card, about 0·08 cm. thick, perforated with holes which are depressed conically at one side, and raised at the other. These holes may be made by punch-

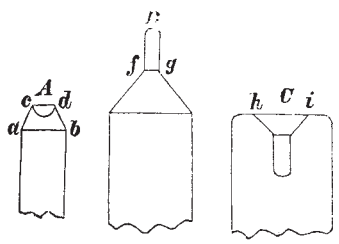

FIG. 5.

ing the card upon a lead block with a steel perforating-punch of the form shown in Fig. 5, A, the dimensions of which are: $ab = 0{\cdot}38$ cm.; $cd = 0{\cdot}2$ cm. The holes should be from 0·6 to 0·65 cm. apart from one another. When a card so perforated is held in front of the opening of the resonant-box of the tuning-fork it is repelled if the smaller ends of the conical holes are toward the box; or is attracted if the wider openings are toward the box. A better, but less simple, way of perforating the cards is by the use of the conical steel punch shown in Fig. 5, B, and the matrix, Fig. 5, C. The angle of the cone is 55°, and the narrow projecting nose of steel is 0·2 cm. The card should be damped, laid on the matrix C, and the hole pierced by two or three blows upon the die. Dr. Dvorák prefers this plan: it throws up a high burr or edge behind the conical hole, and such perforations are more effective. The cards may be varnished, and are then mounted upon the cross. The rotations are more rapid if the cards are set on obliquely in the fashion shown in Fig. 4, E, the burred sides being outwards. Cards with twenty-five perforations so mounted rotate briskly when the "mill" is set in front of the resonant-box.

The fourth apparatus of Dvorák is called by him an "acoustic anemometer." It is shown in Fig. 6. This is merely a little "mill" of simple construction, the vanes being small pieces of stiff paper or card slightly curved. The sounding-box previously described is placed a little way from it, and between them is held an ordinary Helmholtz's resonator, with its wide mouth, *b*, turned toward the box, and its narrow opening, *a*, toward the mill. From what has been previously said it will be understood that the internal increase of pressure in the resonator at *a* has the effect of driving a jet of air gently against the sails of the mill, which consequently rotates. Dr. Dvorák also suggests that this two-aperture resonator may be replaced by one having but one aperture, as shown at R, with its

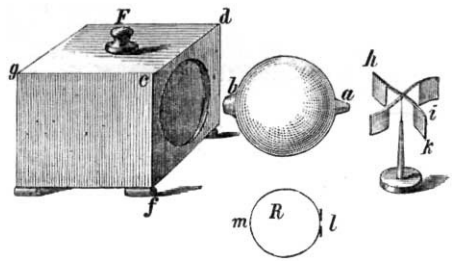

FIG. 6.

open side, *l*, turned towards the mill. This resonator is formed of a glass ball cut away at one side and cemented to a glass plate having a small hole at the centre. It may be remarked that when the air ejected from the mouth of this resonator is examined by the method of mixing smoke with it, and then viewing it through slits cut in a rotating disk, the currents are seen to consist of a series of vortex-rings.

A second kind of "acoustic anemometer" may be made by taking a card pierced with 100 conical holes, as previously described, and placing this between the resonant-box and the "mill." The latter rotates in the wind which passes through the conical holes.

Space does not admit of a comparison being drawn between these instruments and those of Mayer, Mach, and others, which are very closely akin in their design and mode of action, interesting though such a comparison might be. Nor can we here compare the action of these instruments with the "phonomotor" with which Mr. Edison literally accomplished the feat of talking a hole through a deal board. But this remarkable machine was a purely mechanical toy, which converted the vibrations of the voice, by means of a very finely-cut ratchet-wheel, into a motion of rotation round an axis.

SILVANUS P. THOMPSON

NOTES

IN the last week British science has sustained a great loss in the death of Mr. Thomas Chenery, the editor of the *Times*. During his all too short reign the leading journal of Europe has been in strict harmony with the real progress of humanity, instead of being merely a chronicle of "politics" and "society," and day by day it has been wonderful to watch with what continuous well-balanced vigour and skill the general public has been made interested in the victories achieved in the domains of science, literature, and art, as only a daily journal can interest it.

Never before in the history of daily journalism in any country did science receive the recognition which Mr. Chenery accorded to it. Mr. Chenery was not only a great scholar, but the nearest approximation to an admirable Crichton that we have known, and in this we find the secret of his skill as an editor. So many-sided was he that whether teaching Arabic at Oxford as Lord Almoner's Professor; taking his part in the revision of the Old Testament; acting as Special Correspondent in the trenches in the Crimea; at his post as Editor of the *Times* or in private life, he won the admiration of all who knew him by his deep knowledge and splendid modesty. He was a perfect friend, and gained the respect and love of all who came into contact with him.

DR. JOHN HUTTON BALFOUR, Emeritus Professor of Medicine and Botany in the University of Edinburgh, Regius Keeper of the Royal Botanic Garden, and Queen's Botanist for Scotland, died on Monday at Inverleith House, Edinburgh. He was born in 1808. Dr. Balfour was the father of Prof. Bayley Balfour, whose appointment to the vacant Chair of Botany at Oxford we announce to-day. We hope to say more about the late Prof. Balfour next week.

THE death is announced of the distinguished American geographer, Prof. Arnold Henry Guyot. He was born at Neuchâtel, Switzerland, on September 28, 1807. He studied at Neuchâtel, Stuttgart, and Carlsruhe, and at the last-named place formed a close friendship with Agassiz, with whom he studied natural science. In a tour through Switzerland in 1838 he first discovered the laminated structure of the ice in glaciers, and showed that the motion of the glacier is due to the displacement of its molecules. Agassiz, Forbes, and others afterwards confirmed these discoveries. For seven successive summers Guyot now investigated the distribution of erratic boulders, tracing them on both sides of the Central Alps, in Switzerland and Italy, over a surface 300 miles long and 200 miles wide, and delineating eleven different regions of rocks. Their vertical limits and the laws of their descent were determined by means of more than 3000 barometrical observations; and the characteristic species of rock of each basin were tracked step by step to their source. In the United States he was employed by the Massachusetts Board of Education to deliver lectures in the normal schools of the State, and before the teachers' institutes, and by the Smithsonian Institution to organise a system of meteorological observations. In 1855 Guyot was appointed Professor of Physical Geography in the College of New Jersey at Princeton, which post he retained till his death. He was awarded a medal for his researches at the Vienna International Exhibition of 1873.

THE Royal Society has appointed a committee, consisting of Sir F. Evans, Prof. Judd, Mr. Lockyer, Mr. R. H. Scott, General Strachey, and Mr. G. J. Symons, with power to add to their number, to collect the various accounts of the volcanic eruption at Krakatoa, and attendant phenomena, in such form as shall best provide for their preservation and promote their usefulness; and a sum of 25*l.* has been placed at their disposal for this purpose. In connection with this we direct attention to the letter of Mr. Symons in our Correspondence Columns.

THE following note has been sent us from the Meteorological Office:—"We have received notice of the establishment of a system of storm and weather warnings on the Spanish coast. The warnings are based upon observations received from stations reporting daily by telegraph to the Marine Observatory at San Fernando, which is superintended by Capt. C. Pujazon of the Spanish Navy. This institution also issues a daily weather report and chart."

THE "Johns Hopkins University Circulars" have become an important medium for communicating briefly the results of research in all departments in connection with the many-sided institution which issues them. Doubtless they are to be found at the leading scientific centres in this country, and are always well worth looking into. The number for January contains a brief report of the meetings in connection with the departure of Prof. Sylvester from America; how highly he was appreciated there is evident from the following:—On the afternoon of December 20 the academic staff of the University met in Hopkins Hall, by invitation of the President, and after a brief review by Dr. Story of the mathematical lectures here given from 1876 to 1883, and a like review by Dr. Craig of the contributions printed in the *American Journal of Mathematics*, Prof. Gildersleeve read the following paper, which, on motion of Prof. Rowland, was adopted by the meeting as an expression of their respect and good will. "The teachers of the Johns Hopkins University, in bidding farewell to their illustrious colleague, Prof. Sylvester, desire to give united expression to their appreciation of the eminent services he has rendered the University from the beginning of its actual work. To the new foundation he brought the assured renown of one of the great mathematical names of our day, and by his presence alone made Baltimore a great centre of mathematical research. To the work of his own department he brought an energy and a devotion that have quickened and informed mathematical study not only in America, but all over the world; to the workers of the University, whether within his own field or without, the example of reverent love of truth and of knowledge for its own sake, the example of a life consecrated to the highest intellectual aims. To the presence, the work, the example of such a master as Prof. Sylvester, the teachers of the Johns Hopkins University all owe, each in his own measure, guidance, help, inspiration; and in grateful recognition of all that he has done for them, and through them for the University, they wish for him a long and happy continuance of his work in his native land; for themselves the power of transmitting to others that reverence for the ideal which he has done so much to make the dominant characteristic of this University."

AN ascent of Ben Nevis was made on Monday by Mr. C. D. Cunningham, a member of the Alpine Club, accompanied by M. Emile Rey, a Swiss guide, and John Cameron, the well-known guide at Fort William. There were about six inches of snow on the ground from the commencement of the new road to the Red Burn. Here considerable difficulty was experienced in crossing the Burn and arriving on the top of the opposite bank, owing to the great quantity of snow which had drifted into the watercourse. From the well to the summit the ground, covered with deep snow, was hard frozen, making the task comparatively easy. Mr. Omond and his companions at the Observatory appeared in good health and spirits, and entertained the party in the most hospitable manner. The ascent occupied three hours thirty-five minutes, and the descent two hours.

THE estimates submitted to the Dominion Parliament include (says a Reuter's telegram from Ottawa) the sum of 25,000 dollars for the expenses connected with the meeting of the British Association at Montreal this year.

THE German Cholera Commission has sent a fifth report from Calcutta, dated January 5. Dr. Koch seems to have really discovered special cholera bacilli. The Commission was further occupied with the investigation into the causes of the great decrease in cholera mortality in Calcutta, where the percentage of deaths per thousand has diminished from ten to three. This diminution is attributed to the improvement of the water supply.

THE Nautical Meteorological Office of Sweden maintains at present nineteen stations at which meteorological observations are made on a large scale, twenty stations for measuring the fall of rain and snow, and sixteen hydrographical observatories. Weather journals were last year received from eleven men-of-war and fifteen merchantmen. The Meteorological Office in London

having requested that of Sweden to forward as complete journals as possible of the meteorological phenomena of the North Atlantic Ocean between August 1, 1882, and September 1, 1883, the Office has made a careful abstract of these journals for this purpose.

THE consistory of the Upsala University has voted a sum of about 200*l.* for the purchase of objects of natural history for the University collected by the *savants* of the *Vanadis* Expedition round the world, now taking place.

On January 14 a "green" moon was observed at Kalmar in Sweden. At about 5 p.m., just after the sun had set, leaving an intense purple glow on the sky—more intense than the late sun-glows—the moon came out of a layer of heavy clouds in the east. A few seconds after—the disk being then perfectly clear—a light haze gathered around it, partly veiling it, which immediately changed the bright silver colour to an emerald green. The phenomenon lasted for three minutes, when the disk again by degrees assumed its former brightness. A similar phenomenon was observed near Stockholm on January 17 at about 8 o'clock in the morning. It lasted about three minutes.

THE Council of the Royal Meteorological Society have arranged to hold, at 25, Great George Street, S.W., by permission of the President and Council of the Institution of Civil Engineers, on the evening of March 19 next, an Exhibition of Thermometers. The Committee will also be glad to show any new meteorological apparatus invented or first constructed since last March; as well as photographs and drawings possessing meteorological interest.

A SPECIAL meeting of the Committee of the Sunday Society was held on Monday afternoon, February 4, at 9, Conduit Street, W., Prof. W. H. Corfield, M.D., in the chair. The Honorary Secretary submitted a Report on the recent voting as to the future political action of the Society, from which it appeared that 391 had voted in favour of making the Sunday opening of museums a test question at elections of Members of Parliament, and that 470 voted against this proposal; 853 voted in favour of making the question the subject of an annual motion in the House of Commons, and only 11 voted against this proposal. Resolutions were subsequently passed pledging the Society to action in accordance with these results.

LIKE its better known namesake in the metropolis, the Royal Institution, Liverpool, has done much to popularise scientific knowledge during the present century. So far back as 1820 it first gave a permanent home to a scientific society in Liverpool, by admitting the Literary and Philosophical Society to share its roof, for the purpose, say the Minutes, "of extending the knowledge of arts and sciences." Since then the number of societies with scientific aims has steadily grown in Liverpool, and the number of members composing them to some extent increased as steadily. The accommodation of the Institution is found to be limited, and the idea of devoting the whole of the available space for the purpose of meetings is beginning to take definite shape, and was supported by Mr. Morton, F.G.S., in his presidential address last week. A very large part of the building is occupied by the museum, which was formerly the most important in Liverpool; for many years not less than 30,000 persons visited it on free days annually; this number was maintained up to 1868-69, when it all at once fell off; last year the number was only 4489, of whom only 1019 visited the natural history collections. This diminution of interest was coincident with the opening of the Free Public Museum. In 1817 the Institution disposed of the mammalia, reptiles, fishes, crustacea, polyzoa, and corals in the museum, and it is thought desirable that the remaining collections of interest and *local character* should be absorbed into the Corporation Museum. The Institution has schools which are in an exceedingly prosperous condition, and its library has a large collection of standard works in natural science.

IN a letter on the remarkable sunsets from Mr. S. E. Bishop, dated Honolulu, January 15, the writer mentions the important fact that the reddish haze was seen 4000 miles west of Panama on September 3 from the barque *Southard-Hurlburt*.

THE Worshipful Company of Clothworkers has been pleased to grant a donation of 21*l.* to the National Health Society, 44, Berners Street.

A PROPOSITION has been presented to the Municipal Council of Paris to give the name of Darwin to a new street about to be opened.

THE Hotel Dieu, Paris, having Gramme machines and steam-engine, the Administration of the Assistance Publique has decided to introduce experimentally the use of Edison incandescent lights in the halls inhabited by patients. The Hotel Dieu is the largest and the leading French hospital.

THE French Minister of Public Instruction will organise in Paris an exhibition of the objects which have been collected at Cape Horn by the *Romanche*. The collection is composed of 170 cases of valuable specimens of mineralogy, geology, and zoology, as well as living plants which will be acclimatised as far as possible in French forests.

THE International Association of Electricians, of which we have announced the creation in Paris, will hold its monthly sittings at the rooms of the Society of Geography. The first took place at the beginning of this month. The first part of the *Transactions* of the Association has reached us.

A NEW popular scientific paper has been published in Paris entitled *Le Mouvement Scientifique*.

THE Aristotelian Society for the Systematic Study of Philosophy will meet henceforth in the rooms of the Royal Asiatic Society, 22, Albemarle Street. W.

SHORTLY before sunset on Tuesday evening when the whole of the population of Notaresco, in the Abruzzo, had retired within doors on account of the intense cold, a shock of earthquake was felt, of such severity that the people rushed headlong into the streets and remained there until after midnight. The shock was also felt at Atri, Guilianova, Avellino, and Citta Sant' Angelo. A violent earthquake also occurred on the 10th inst. in the district of Birvari, Province of Bitlis, Turkey. A large number of houses and other buildings were thrown down.

MOUNT ETNA has, since Saturday, entered into an eruptive stage by throwing out ashes from the topmost crater. Strong earthquake shocks in the districts around the mountain preceded the outbreak.

AN unusually bright meteor was seen in Western Germany on January 28, about 7.30 p.m. At Barmen its motion seemed to be from east to west, while at Neuwied south to north was the direction. Its brilliancy is generally compared to that of the full moon.

AT the last meeting of the Berlin Anthropological Society, Prof. Nehring reported on the discovery of a cave near the village of Holzen (Brunswick), which is of special interest, inasmuch as there is strong evidence of cannibalism among the ancient cave men of that place, the first time that such evidence is forthcoming concerning the prehistoric inhabitants of what s now Germany. In Belgium and Spain similar evidence had been found, but had been dismissed as doubtful. The bone-remains of the Holzen cave are not completely calcined; at the

same time there is proof that the bones were opened to get at the marrow. But the strongest evidence of cannibalism was furnished by the arrangement in which the bones were found. Besides these bones and bone implements, roughly worked bronzes were found. At a lower level numerous lemming bones were found, which, with regard to the age of the cavern, seems to point to the Glacial epoch. In the debate following Prof. Nehring's report, Prof. Virchow raised some doubts regarding the cannibalism of the cave dwellers.

A MEETING of delegates of Natural History Societies in the east of Scotland (including the counties of Fife, Perth, Forfar, Kincardine, and Aberdeen) was held in the lecture-room of the Perthshire Natural History Museum, Perth, on Nebruary 9, to consider the question of federation alluded to in NATURE. The following societies were represented:—Aberdeen Natural History Society, Alford Field Club and Scientific Society, Arbroath Horticultural and Natural History Association, Dundee Naturalists' Society, Dundee Naturalists' Field Club, Kirkcaldy Naturalists' Society, Largo Field Naturalists' Society, Montrose Natural History and Antiquarian Society, and the Perthshire Society of Natural Science—being all but four of the Societies in the above-mentioned counties. Two of these four societies considered that their objects did not quite entitle them to join the proposed federation, at least for the present; and from the other two no response had been received. After deliberation it was resolved to federate the societies under the title of "The East of Scotland Union of Naturalists' Societies." The objects of the Union are the promotion of good and systematic work by the various societies in it, and of friendly intercourse amongst their members; its affairs are to be conducted by a council of representative members, two being elected by each society. The president is to be a man of scientific eminence, connected with the district; and it is to hold an annual general meeting at the headquarters of the various societies in rotation, and other meetings in such places in the district as may be agreed on. The Union starts with a membership of about 1300. It was determined that the first general meeting should be held in Dundee on June 6 and 7 next. Dr. Buchanan White, F.L.S., was elected President, and Mr. F. W. Young, F.R.S.E., Hon. Secretary of the Dundee Naturalists' Society, was appointed Secretary.

WE learn from *Science* that Mr. Joseph Wharton of Philadelphia writes to the *Public Ledger* of that city (January 22) that he has found volcanic glassy dust in fresh, clean snow of recent fall. The snow, melted under cover in the porcelain vessel it was gathered in, showed at first no sediment; but after a time, and aided by a gentle rotatory movement which brought all to the deepest point, a slight deposit appeared. By pouring off most of the water, and evaporating the remainder, a little dry dust was obtained, which, even to the naked eye, showed, in the sunlight, tiny vitreous reflections. The dust weighed by estimate a hundredth of a grain, and showed under the microscope the characteristics of volcanic glass. It was partly irregular, flat, and blobby fragments, and partly filaments more or less contorted, which were sometimes attached together in little wisps, and were mostly sprinkled with minute glass particles. Under a knife-edge the filaments broke easily and cleanly. The irregular fragments were of various sizes and shapes, mostly transparent, but, even when examined by strong transmitted light, showing no trace of crystalline structure. Their diameter was about that of single filaments of silk. No crystalline particle of pyroxine, or black crumb of augite, such as observers have found elsewhere in similar dust, was present; nor did a strong magnet stir any particles of magnetic oxide of iron, though they also have been found in other volcanic dust. It may fairly be assumed that those heavier minerals, if at first mingled with the volcanic glass, had been already deposited during the long voyage through more than ten thousand miles of space and more than four months of time, while the tenuity of the intrinsically lighter glass threads (the Pele's hair of Mauna Loa) enabled them to float farther from the point of eruption.

"THE International Conference for fixing upon a universal prime meridian and a universal system of time has," *Science* states, "at length been called by the State Department to meet in Washington, Oct. 1. Diplomatic proceedings are always expected to go on with a certain dignified leisure; but the arrangements for the meeting of this conference have been delayed far beyond anything customary even in diplomacy. The act authorising the conference became a law in August, 1882. As there was some doubt whether there would be a sufficiently general response to the invitation to insure the success of the conference, a preliminary circular requesting the views of the various governments interested, and an expression of their willingness to enter the conference, was issued from the State Department toward the end of 1882. The responses were in some cases favourable, and in others negative or undecided. A desire was felt by the Europeans to have a preliminary discussion of the subject at the International Geodetic Conference at Rome in October, 1883. The feeling at this conference having shown that there would be little difficulty in the universal adoption of the Greenwich meridian, the final step of calling the conference was taken. Why so late a date was chosen we are not informed."

THE Magdeburg Wetter Verein has been transformed into a branch of the general German Meteorological Society, which is under the direction of Dr. Neumayer of Hamburg.

THE valuable ethnological collection made by Herr Zembsch at Apia, for many years German Consul-General at that place, has been purchased by the Ethnological Museum at Berlin. It consists of over 500 specimens.

THE additions to the Zoological Society's Gardens during the past week include a Chacma Baboon (*Cynocephalus porcarius* ♀) from South Africa, presented by Col. Gildea; a Macaque Monkey (*Macacus cynomolgus* ♂) a Black Kite (*Milvus migrans*) from India, presented by Mr. John M. Hagerman; a Common Hedgehog (*Erinaceus europæus*), British, presented by Mr. Archibald Aitchinson; a Bonnet Monkey (*Macacus sinicus*) from India, presented by Mr. J. Wilson; a Vulpine Phalanger (*Phalangista vulpina*) from Australia, presented by Capt. F. R. Slater; two Common Jackdaws (*Pica rustica*), British, presented by Master Harrott; a Chanting Hawk (*Melierax musicus*) from South Africa, a Partridge Bronze-winged Pigeon (*Geophaps scripta*) from New South Wales, purchased.

OUR ASTRONOMICAL COLUMN

PONS' COMET.—It appears that this comet was sufficiently conspicuous to attract the attention of unscientific passengers on board one of our mail steamships in approaching Rio de Janeiro from the south on January 20, while it was an object of popular interest in Southern Italy towards the end of that month, according to the Naples correspondent of the *Times*. Observers in the other hemisphere may be able to follow it for several months longer; in the last week in June the theoretical intensity of light will be equal to that at the date of its discovery by Mr. Brooks.

This comet approaches the orbit of Venus within 0·076; that of Jupiter within 1·98; and that of Uranus within 1·17. The ascending node falls at a distance of 15·46. During the revolution 1812–1884, the calculations of MM. Schulhof and Bossert show that the approximate effect of planetary attraction upon the periodic time, at the instant of perihelion passage in the former year, has been as follows:—

	Days
Comet accelerated by action of Jupiter	446·49
,, ,, ,, Saturn	13·96
Comet retarded by action of Uranus	13·48
,, ,, ,, Neptune	1·48